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Utilization Research & Development Division

Publications and Patents

January - June 1966

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**Agricultural Research Service
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Northern Utilization Research and Development Division
Agricultural Research Service
United States Department of Agriculture
1815 North University
Peoria, Ill. 61604

Issued July 1966

INTRODUCTION

The Congress in 1938 authorized four regional laboratories, now known as Utilization Research and Development Divisions, to conduct basic and applied research designed to expand, improve, and develop through science and technology the utilization of American farm crops. The need and importance of such research arise because the farmer is not organized to carry on modern scientific research to maintain old markets for his products and to create new ones. Since their inauguration, these laboratories have contributed much basic knowledge of the chemical composition and physical properties of farm commodities and have applied this knowledge to create new or improved products and processing technology that have enhanced utilization of many farm commodities.

The Northern Utilization Research and Development Division is responsible for research on industrial utilization of the cereal grains -- corn, wheat, barley, grain sorghum, and oats; and

the oilseeds--soybeans and flaxseed. Except for wheat and barley, the research includes food and feed uses of these crops. In the Department's program of research on replacement crops, the Northern Division conducts all screening and characterization studies on uncultivated plants and their components. It is also responsible for more intensive research on new oilseeds containing erucic acid and on new gum and pulp fiber plants. In addition to its internal program of research, it carries out work through domestic contracts and grants and conducts related research abroad under grants or contracts involving Public Law 480 funds.

The research investigations at the Northern Division are supported by more than 400 people, about one-half of whom have professional status. This body of highly trained men and women with specialized knowledge in various disciplines are responsible for the scientific publications and patents listed here.

REQUEST FOR INFORMATION

The results of the research of the Northern Utilization Research and Development Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 41). As a convenient guide to our publications and patents, a list with abstracts is published semi-annually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

Requests for specific reprints should be by number and addressed to the Northern Division.

Those titles marked with an asterisk [*] are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U.S. Department of Agriculture, Washington, D.C. 20250.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.

January – June 1966

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SUBJECT INDEX FOR PUBLICATIONS

[Compiled by reprint order number. Numbers marked (*) do not have reprints available for distribution.]

CEREAL GRAINS**General:**

1953, 1968, 1969, 1975, 1991, 2002, 2003, 2019, 2027, 2028,
2029, 165-C, 97-F, 98-F, 99-F, 101-F, 102-F, 4-G, 5-G, 6-G

Starch:

1968, 1977, 1988, 2010, 2020, 2029, 160-C, 161-C, 162-C, 165-C

Wheat:

1937, 1949, 1951, 1966, 1968, 1970, 1978, 1987, 1994, 2001,
2005*, 2008, 2011, 2020, 160-C

Corn, Sorghum, and Other Grains:

1964, 1968, 1977, 1993, 2004*, 7-G*

High-Amylose Corn:

1944, 1977

Fermentative Conversion and Microbiology:

1939, 1940, 1972, 1990, 1992, 1995, 1996, 2001, 2005*, 2011,
2012, 2017, 2018, 2022, 2023, 2026, 163-C, 164-C, 97-F, 98-F,
105-F*, 106-F*, 107-F

OILSEEDS**General:**

1942, 1945, 1946, 1952, 1956, 1959, 1960, 1961, 1962, 1963,
1964, 1965, 1967, 1971, 1979, 1997, 1998, 2013, 2014, 2015,
2021, 2024, 103-F*

Linseed Oil:

1936, 1947, 1948, 1963, 1980, 1997, 1998, 2024, 2025

Soybean Oil:

1947, 1958, 1961, 1980, 1982*, 1983*, 1984*, 1985*, 1997, 1998,
2024, 159-C, 168-C, 108-F*

Soybean Meal and Protein:

1950, 1962, 1964, 1974, 2006, 2007, 100-F, 104-F

NEW CROPS**General:**

1959, 1960, 1976, 1989

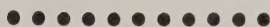
Oilseeds:

1938, 1954, 1955, 1957, 1981, 1986, 1997, 1999, 2000, 2016

Pulping Crops:

1941, 1943

January – June 1966



PUBLICATIONS

[Publications marked (*) are not available for distribution. When requesting reprints, order by number.]

1936 • Counter Double Current Distribution with Continuous Recovery for Isolation of Methyl Linolenate

R.O. BUTTERFIELD, H.J. DUTTON, and C.R. SCHOLFIELD
Anal. Chem. 38(1): 86-88. January 1966

Counter double current distribution (CDCD) was used to produce unisomerized methyl linolenate (methyl 9,12,15-octadecatrienoate) of 99.9% purity from methyl esters of linseed oil without prior concentration. The rate of production is five times that of countercurrent distribution. Production of this

labile lipid illustrates the general applicability of CDCD. In addition, a system is described that continuously recovers the solvent and product. This system completes the automation of the CDCD equipment so that solvent inventory, safety hazards, and labor are reduced.

1937 • Reducing the Microbial Count of Flour

CHARLES VOJNOVICH, V.F. PFEIFER, and E.L. GRIFFIN, JR.
Cereal Sci. Today 11(1): 16-18, 31. January 1966

In experimental milling of wheat having a moderately high population of microorganisms, the microbial counts of the flours tend to follow the ash contents with lowest values in the purest endosperm flour and with highest values in the first break flour. Ordinarily patent flours exclude streams of high microbial populations. Microbial count for the flour fraction was about 10% of the starting wheat; for the feed fraction, nearly 300%.

and hydrogen peroxide were used in the wash and temper solutions applied before milling, microbial count of the flours was reduced. Dry cleaning the wheat before milling was also effective. Not one of these methods by itself, however, was suitable for reducing the microbial population of flour from highly contaminated wheats to below 5,000 per gram, and the efficacy of treatments varied with different blends of wheats.

When such sanitizing agents as chlorine, bromine,

1938 • **The Many Uses of Crambe Products**
 IVAN A. WOLFF
 Crops & Soils 18(4): 10-12. January 1966

This review describes the reasons for seeking new domestic oilseeds and tells about the chemical compositional characteristics and end-use possibilities that make crambe an attractive new crop plant.

The article is published along with another that describes "What We Know About Growing Crambe" by George A. White of USDA's Crops Research Division.

1939 • **Microbial Polymers. A Preliminary Cost Estimate**
 V.E. SOHNS, S.P. ROGOVIN, and E.L. GRIFFIN, JR.
 North. Util. Res. Develop. Div.
 U.S. Agr. Res. Serv., ARS-71-33, 16 pp. February 1966. [Processed]

Production costs are reported for both crude and refined microbial polymers. Crude product is recovered by either drum or spray drying; refined polymer, by either a methanol precipitation method

or isolation with quaternary ammonium compounds. Degree of purification of polymer significantly affects production costs.

1940 • **Elution of Exocellular Enzymes from Saccharomyces fragilis and Saccharomyces cerevisiae**
 RALPH WEIMBERG and WILLIAM L. ORTON
 J. Bacteriol. 91(1): 1-13. January 1966

Invertase and acid phosphatase are repressible exocellular enzymes in Saccharomyces fragilis and S. cerevisiae. Conditions for eluting these enzymes from both organisms were compared. Either KCl or β -mercaptoethanol eluted the enzymes from S. fragilis, and the amounts eluted varied quantitatively according to the physiological age of the organism. In addition to eluting enzymatic activity from the

cells, these reagents also caused a large increase in the amount of activity that remained associated with the cells of S. fragilis. Invertase and acid phosphatase were not removed from cells of S. cerevisiae by KCl or β -mercaptoethanol. These enzymes were separated from S. cerevisiae cells only when there was some degree of cell-wall digestion by snail gut fluid.

1941 • A Search for New Fiber Crops: Analytical Evaluations

G.H. NELSON, T.F. CLARK, I.A. WOLFF, and QUENTIN JONES¹

(¹USDA Crops Research Div., Beltsville, Md.)

Tappi 49(1): 40-48. January 1966

A survey of annual plants for papermaking potential has been extended by analysis and evaluation of an additional 208 species (32 families) bringing the total investigated to 387 species (44 families). Earlier conclusions are reinforced that the prob-

ability of finding annual plants having both agronomic and technological suitability for papermaking is greatest in the mallow, grass, and legume families. Individual exceptions may be found, however, in the family Moraceae as exemplified by hemp.

1942 • Azelaaldehydic Acid Ester-Acetal Derivatives as Plasticizers for Poly (vinyl chloride)

E.H. PRYDE, D.J. MOORE, J.C. COWAN, W.E. PALM,¹ and L.P. WITNAUER¹

(¹East. Util. Res. Develop. Div., Philadelphia, Pa.)

Polymer Eng. Sci. 6(1): 60-65. January 1966

Certain ester-acetal derivatives of azelaaldehydic acid have been evaluated as a new type of plasticizer for poly(vinyl chloride) (PVC). In general, these compounds have high compatibility and impart excellent low-temperature, mechanical, heat- and light-stability properties to the plasticized PVC. The 2-

ethylhexyl ester bis(2-methoxyethyl) acetal, in particular, appears to have the best combination of properties for a useful plasticizer. A unique and useful type of plasticizer-stabilizer can be made from derivatives of azelaaldehydic acid.

1943 • Final Report to Structural Fibrous Materials Committee on Board-Forming Method T 1001 m-60

T.R. NAFFZIGER

Tappi 49(1): 100A-102A. January 1966

A membership survey was conducted by Subcommittee S-3, Test Formation, Technical Association of the Pulp and Paper Industry, of which Dr. Naffziger is chairman, to determine the general satisfaction and acceptability of Standard Method

T 1001 m-60. The results have been evaluated, and analysis of the ballots showed that 83% were in favor of the current method and 17% offered minor suggestions for improvement. Sixty-eight percent of the respondents now use this method.

1944 • Oxygen Permeability of Amylomaize Starch Films

A.M. MARK, W.B. ROTH, C.L. MEHLTRETTER, and C.E. RIST
Food Technol. 20(1): 75-77. January 1966

The resistance of amylomaize starch films to oxygen penetration was determined in a wide relative humidity (RH) range at 5° and 25° C. Both plasticized (16% glycerol) and unplasticized films had no detectable oxygen permeability up to about 100% RH.

At moisture saturation, however, maximum permeabilities for films tested at 5° and 25° C. were, respectively, 1.5×10^{-10} and 3.8×10^{-10} cc/sec./cm.²/cm. Hg/cm.

1945 • A Molecular-Still Sample Reservoir Offering Precise Flow Control

R.L. HOFFMANN, F.J. CASTLE, and C.D. EVANS
J. Am. Oil Chemists' Soc. 43(1): 52-53. January 1966

A molecular-still sample reservoir was designed to allow critical adjustment of sample flow. A specially tipped needle valve controls flow precisely.

The valve remains leakproof at pressures down to 10^{-4} mm. Hg. Since no stopcock grease is required, contaminants in the distillate are also avoided.

1946 • Reduction of Methyl Oleate Ozonolysis Products to Aldehydes with Activated Zinc

R.A. AWL and E.H. PRYDE
J. Am. Oil Chemists' Soc. 43(1): 35-37. January 1966

Reduction of methyl oleate ozonolysis products with active zinc in the absence of acid or water gave an 88% yield of methyl azelaaldehyde. Under these neutral conditions, side reactions such as acetalization and aldehyde condensations could be more con-

veniently avoided than when zinc-acetic acid reduction is used. The activated zinc was prepared by treatment with acetic acid followed by washing to remove the acid.

- 1947 • Homogeneous Catalytic Hydrogenation of Unsaturated Fats: Metal Acetylacetonates**
E.A. EMKEN, E.N. FRANKEL, and R.O. BUTTERFIELD
J. Am. Oil Chemists' Soc. 43(1): 14-18. January 1966

Hydrogenation of linseed and soybean methyl esters in methanol was achieved at 100° to 180° C., 100 to 1,000 p.s.i. H₂, and 0.05 to 0.25 moles catalyst per mole of ester. The relative activity of metal acetylacetonates in decreasing order was: nickel(III), cobalt(III), copper(II), and iron(III). Reduction occurred readily in methanol solution but only slowly in dimethylformamide and acetic acid. No reduction occurred in the absence of solvents. Soybean oil was hydrogenated rapidly with nickel(III) acetylacetonate in methanol, but in this system the triglycerides were converted to methyl esters. Nickel(III) acetyl-

acetonate was the most selective catalyst toward linolenate hydrogenation. Methyl linoleate and linolenate hydrogenated with nickel(III) acetylacetonate were fractionated into monoenes, dienes, and trienes. The cis monoenes separated in 62 to 68% yield had double bonds mostly in the original position. The remaining trans monoenes had extensively scattered unsaturation. The dienes and trienes showed no conjugation, but some of the double bonds in the dienes were not conjugatable with alkali. Little stearate was formed.

- 1948 • Water-Solubilizable Oxazoline Polyester Coating Resins**
W.J. DeJARLAIS, L.E. GAST, and J.C. COWAN
J. Am. Oil Chemists' Soc. 43(1): 41-45. January 1966

Preparation of water-soluble coating resins was attempted by reaction of linseed acids with an aminopolyol, tris(hydroxymethyl) aminomethane, and then with itaconic acid. The amino alcohol reacts with linseed acids to form amides and then oxazolines. The oxazolines undergo ring-opening to in-

crease their functionality to greater than two. The oxazoline-polyester resins are only partially water-soluble, but homogeneous aqueous solutions are formed by addition of isopropanol and neutralization with an amine. Film properties are also described.

- 1949 • Quantitative Microscopic Evaluation of Endosperm Breakdown in Conditioned Hard Red Winter Wheat**
M.J. WOLF, W.F. KWOLEK,¹ and J.R. McCARTHY
(¹USDA Biometrical Serv., Peoria, Ill.)
Cereal Chem. 43(1): 43-61. January 1966

The amount of free protein and free starch present in a flour was taken as an estimate of the degree of endosperm breakdown in wheats conditioned at various moistures and temperatures. Percentages of free protein, free starch, and endosperm were calculated (weight basis) from microscopic sizing data on flours. Free protein content of flours from tempered Wichita and Ponca wheats was ordinarily below 2% of flour weight. Free protein content was highest at low moisture levels (in dried wheat) regardless of holding temperature (3° to 70° C.). Tempered flour showed the same trend with respect to protein release as tempered wheat. Protein release in flour from immature wheat is significantly

higher than at later stages. Only starch granules less than about 10 microns in diameter were free of protein. Free starch content was independent of conditioning treatments. Highest free protein yields (about 4% of the flour) were noted under a combination of low-moisture and high-temperature treatment. A maximum of about 25% of the total protein, calculated on the basis of the Kjeldahl nitrogen of the flour, was in the free form. Results suggest that highest free protein release may be expected by milling grain at around 16% moisture, where flour yield is optimal, then regrinding the flour after drying it to moisture levels below 10%.

1950 • Carbohydrate Content of Soybean Proteins

W.J. WOLF, DAYLE ANN SLY, and W.F. KWOLEK¹

(¹USDA Biometrical Serv., Peoria, Ill.)

Cereal Chem. 43(1): 80-94. January 1966

Several fractions of soybean proteins were analyzed with phenol-sulfuric acid to determine the range of carbohydrate content. Protein fractions, prepared by a variety of purification techniques, had the following carbohydrate analyses, expressed as percent glucose: Water-extractable proteins, 1.6 to 2.0; isoelectrically precipitated globulins, 1.5 to 2.3; whey proteins, 2.8 to 4.2; glycinin, 1.5 to 1.9; cold-insoluble fraction, 0.3 to 0.5; and purified 11S component, 0.2.

on hydroxylapatite columns were also analyzed with phenol-sulfuric acid. Although carbohydrates eluted with all the proteins present in the water-extractable mixture, definite fractions were indicated. The first carbohydrate fraction was nondialyzable, was eluted as a sharp peak slightly ahead of the first protein fraction, and occurred largely in whey upon isoelectric precipitation of the globulins. Four or more carbohydrate fractions eluted with the other water-extractable protein components.

Effluents of soybean proteins chromatographed

1951 • Optical Rotatory Dispersion of Wheat Gluten, Gliadin, and Glutenin in Acetic Acid and Aluminum Lactate Systems

J.E. CLUSKEY and Y.V. WU

Cereal Chem. 43(1): 119-126. January 1966

The conformations of gluten, gliadin, and glutenin were studied by optical rotatory dispersion in 0.01 *N* acetic acid and also in 0.008 *M* aluminum lactate-lactic acid buffer, pH 3.1, $\mu = 0.05$, with and without 3 *M* urea. All three proteins in each solvent exhibited a negative Cotton effect at 233 *mμ* (specific rotation ranging from -3,900° to -6,300°). Results indicate that gliadin contains more alpha-helix than glutenin and whole gluten. The amount of alpha-helix in a

given protein is the same in acetic acid and aluminum lactate. With inclusion of 3 *M* urea in the aluminum lactate buffer, the helix content decreases slightly for each protein. Glutenin and gliadin in acetic acid and in aluminum lactate probably are mixtures of random coil and helix. These results supplement those reported earlier by Wu and Cluskey using different solvent systems.

1952 • Industrially Important Reactions [of Fatty Acids]

E.H. PRYDE

In "Kirk-Othmer Encyclopedia of Chemical Technology," 2nd ed., vol. 8, pp. 818-824. 1965

Industrially important reactions of fatty acids are reviewed, including esterification, polymeriza-

tion, oxidation, hydrogenolysis, salt formation, and alpha-sulfonation.

1953 • A Kinetic Study of the Ninhydrin Reaction
 MENDEL FRIEDMAN and CARL W. SIGEL
 Biochemistry 5(2): 478-485. February 1966

Reaction rates of alpha-amino acids with ninhydrin at 30° and 100° C. were studied as a function of basicities and steric environments of amino groups. Based on the observed reactivities of alpha-amino acids at 30° C., a linear free-energy equation was derived that permits calculation of separate polar and steric parameters associated with the amino acids which influence rates. The rate-determining step in the ninhydrin reaction involves a nucleophilic-type displacement of a hydroxy group of

ninhydrin by a nonprotonated amino group. The time dependence of leucine color yields of several sterically hindered alpha-amino acids was determined. Reactivity studies with several model compounds are in accord with a general mechanism for the ninhydrin reaction. Evidence is presented supporting the view that the low color yields of Ruhemann's purple in the reaction of aminothiols with ninhydrin are caused by a competitive reaction of the sulfhydryl group with ninhydrin.

1954 • (S)- and (R)-1-Cyano-2-hydroxy-3-butene from Myrosinase Hydrolysis of epi-Progoitrin and Progoitrin
 M.E. DAXENBICHLER, C.H. VanETTEN, and I.A. WOLFF
 Biochemistry 5(2): 692-697. February 1966

Enzymic hydrolysis of epi-progoitrin, the major thioglucoside from crambe seed, at pH 3.0 produced the previously characterized (R)-goitrin and an unknown nitrile. The nitrile was isolated and shown to be (S)-1-cyano-2-hydroxy-3-butene. Measurements were obtained for the yield of (R)-goitrin and (S)-1-cyano-2-hydroxy-3-butene as a function of the pH during the hydrolysis of epi-progoitrin. Hydroly-

ysis of progoitrin from rutabaga seed formed the enantiomeric (S)-goitrin and (R)-1-cyano-2-hydroxy-3-butene. In the Cahn-Ingold-Prelog system epi-progoitrin has the (S) configuration at the asymmetric carbon atom of the aglycon and may, therefore, also be designated as a salt of 2-(S)-hydroxy-3-butenylglucosinolate.

1955 • New Enynolic Acids from Acanthosyris. Structures and Chemistry
 R.G. POWELL, C.R. SMITH, JR., C.A. GLASS, and I.A. WOLFF
 J. Org. Chem. 31(2): 528-533. February 1966

The seed oil of Acanthosyris spinescens contains three previously unknown hydroxyacetylenic fatty acids. These are: 7-Hydroxy-trans-10,16-heptadecadien-8-ynoic acid (Ia), 9%; 8-hydroxy-trans-11,17-octadecadien-9-ynoic acid, 4%; and 7-hydroxy-trans-10-heptadecen-8-ynoic acid, 6%. The methyl ester Ib does not dehydrate readily in acidic methanol but instead undergoes slow etherification. The hydroxyl in the grouping -CH=CHC≡CCHOH- is less

readily etherified than that in the isomeric grouping -C≡CCH=CHCHOH-. Two etherification products of Ib were detected: Methyl 7-methoxy-trans-10,16-heptadecadien-8-ynoate and a dimethoxyallene that was not fully characterized. Two other derivatives of Ib have been synthesized: Methyl 7-hydroxyheptadecanoate and trans-8-trans-10,16-heptadecatriene-1,7-diol.

1956 • **N-2-Mercaptoethyl Amides of Fatty Acids – A New Class of Derivatives**

A.W. SCHWAB, J.A. STOLP, L.E. GAST, and J.C. COWAN

J. Am. Oil Chemists' Soc. 43(1): 30-32. January 1966

Twelve N-2-mercaptoethyl amides have been prepared by reacting 2-aminoethyl mercaptan with a carboxylic acid in refluxing xylene or toluene. All products were well-defined crystalline compounds, except for the dimer acid derivatives. Addition of dithiol amides, prepared from dimer acids and 2-aminoethyl mercaptan, to diolefins gave a new class of potential protective coatings, a polyamide of a

dimerized fatty acid with a β -thio linkage. Oxidation of the dithiols gave the corresponding disulfides, another new class of compounds, a polyamide with a β -disulfide structure. Both classes of polymers have film properties. Air-dried films were soft and tacky, but baking the films improved hardness. Dry-to-touch times of less than 2 hours at 150° C. and good alkali resistance were obtained.

1957 • **New Acetylenic Fatty Acids from Acanthosyris spinescens Seed Oil**

R.G. POWELL and C.R. SMITH, JR.

Biochemistry 5(2): 625-631. February 1966

The seed oil of Acanthosyris spinescens contains a number of previously unknown acetylenic fatty acids. These include 17-octadecen-9-ynoic acid, 18%; trans-10,16-heptadecadien-8-ynoic acid, 10%; and trans-11,17-octadecadien-9-ynoic acid, 4%. One

other nonoxygenated C₁₇ acid (9%) is also present but was not fully characterized. A. spinescens is the first of the higher plants found to contain straight-chain C₁₇ acids in more than very small amounts.

1958 • **Selective Hydrogenation of Soybean Oil with Sodium Borohydride-Reduced Catalysts**

SAMBASIVARAO KORITALA and H.J. DUTTON

J. Am. Oil Chemists' Soc. 43(2): 86-89. February 1966

The reaction of metallic salts in aqueous solution with sodium borohydride produces finely divided metals that are catalytically active for hydrogenation. Salts of nickel, cobalt, palladium, and platinum give active catalysts for the selective hydrogenation of soybean oil. When reduced with sodium borohydride, iron and silver salts show no activity at 200° C. and atmospheric hydrogen pressure. The cobalt catalyst

produces the least amount of stearate. Incorporation of palladium, platinum, copper, or chromium up to 2% enhances the activity of the nickel catalyst. When reduced together, copper and chromium salts form catalysts that hydrogenate linolenyl groups in soybean oil seven times more rapidly than linoleyl groups. No stearate formation is observed with these binary catalysts.

1959 • **Composition of Oilseeds. A List of Publications and Patents for 1965**

North. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-71-23-4, 4 pp. February 1966. [Processed]

- 1960 • **Processing Oilseeds, Oil, and Meal. A List of Publications and Patents for 1965**
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-24-4, 2 pp. February 1966. [Processed]
- 1961 • **Edible Soybean Oil. A List of Publications for 1965**
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-25-4, 4 pp. February 1966. [Processed]
- 1962 • **Edible Soybean Protein Products. A List of Publications and Patents for 1965**
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-26-4, 2 pp. February 1966. [Processed]
- 1963 • **Chemically Modified Oil Products and Industrial Uses. A List of Publications and Patents for 1965**
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-27-4, 6 pp. February 1966. [Processed]
- 1964 • **Industrial Uses of Proteins. A List of Publications and Patents for 1965**
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-28-3, 2 pp. February 1966. [Processed]
- 1965 • **Review Articles on Oilseed Crops Research. A List of Publications for 1965**
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-29-4, 2 pp. February 1966. [Processed]
- 1966 • **Effect of Dry and Wet Fractionation on the Strontium-90 Content of Wheat: How Fallout Affects the Bread Grain**
R.A. ANDERSON and V.F. PFEIFER
Am. Miller 94(3): 9-10, 30. March 1966; Die Mühle 103(19): 321. May 1966

Conventional milling of a wheat blend containing 446 pCi/kg. (dry basis) of strontium-90, to 70% extraction, resulted in about 7% of the total strontium-90 in the wheat being located in the flour fraction and the rest in the feed fractions, bran, and shorts. Fine grinding and air classification of this flour caused a shift of the strontium-90 to the two finest fractions, with a moderate reduction in the three coarser fractions as compared to the original flour.

Wet processing of an 85% extraction flour prepared from the wheat blend resulted in 5 to 6% of the strontium-90 in the wheat being found in the edible fractions, gluten, and starch; these fractions represent about 74% of the wheat. In general, fractionation of wheat flour beyond that of conventional milling, either by wet or dry procedures, offers limited possibilities for further reducing strontium-90 in the edible portions separated from wheat.

1967 • Economic Aspects [of Fatty Acids]

E.H. PRYDE

In "Kirk-Othmer Encyclopedia of Chemical Technology," 2nd ed., vol. 8, pp. 839-845. 1965

The growth in production since 1953 of various fatty acids is illustrated in chart and tabular form. Also tabulated is the production of fatty acid deriva-

tives for various applications, particularly plasticizers and surface active agents.

1968 • The Economic Outlook for Increased Industrial Use of Cereals

W.K. TROTTER¹

(¹USDA Econ. Res. Serv., Peoria, Ill.)

Cereal Sci. Today 11(2): 36-40, 44. February 1966

Certain historical relationships are examined and some of the more important economic and technological factors are reviewed that bear on the current outlook for cereal products in industrial uses. Specifically treated are trends in starch

markets and growth in starch competitors; paper, paperboard, textile, and other industrial uses; markets for dry-milled corn and sorghum; industrial markets for wheat; and new cereal developments.

1969 • Microdetermination of Sulfur and Halogens in Nonvolatile Substances in Solution by the Schöniger Flask Method

CLARA MCGREW and CECIL H. VANETTEN

Trans. Illinois State Acad. Sci. 59(1): 58-61. March 1966.

A simple procedure is described to analyze solutions for sulfur and halogen contents by the oxygen flask method. The method gave an average recovery of 100.32% with a standard deviation of 1.376 for 22 sulfur determinations on solutions of S-benzyl-

thiuronium chloride. Results were also good on solutions of other known compounds, extracts from natural products, and commercial preparations. Three compounds boiling below 200° C. gave low determinations.

1970 • Isolation and Characterization of a High-Molecular-Weight Protein from Wheat Gliadin

A.C. BECKWITH, H.C. NIELSEN, J.S. WALL, and F.R. HUEBNER
Cereal Chem. 43(1): 14-28. January 1966

Gliadin, the alcohol-soluble protein of wheat gluten, was found to contain a small amount of a high-molecular-weight (MW) fraction when analyzed by gel filtration on columns of a crosslinked dextran. The chromatograms were quite similar when either 0.01 M or 0.1 M acetic acid was used as eluting solvent. The resolution obtained with 3 M urea-0.01 N acetic acid as eluting solvent, was not so good as with 0.1 M acetic acid. Increasing the temperature from 25° to 40° C. had no effect upon the resolution pattern of the fractions. The heaviest fraction had a MW of about 100,000, whereas the lightest had a MW of about 30,000 in a strongly

deaggregating solvent system. Moving-boundary and starch-gel-electrophoretic patterns of the heaviest fraction as well as amino acid composition, solubility, viscosity, sedimentation, and diffusion constants were suggestive of a low-MW glutenin. The moving-boundary and starch-gel-electrophoretic patterns of the lightest contained the major gliadin components—alpha, beta, and gamma. Alpha-gliadin obtained by chromatography on carboxymethyl cellulose also contained components similar to the heaviest gliadin fraction obtained by gel filtration on crosslinked dextran.

1971 • Desaturation of Fatty Acids in Seeds of Higher Plants

H.J. DUTTON and T.L. MOUNTS
J. Lipid Res. 7(2): 221-225. March 1966

Photosynthesizing flax, soybean, and safflower plants were exposed to $^{14}\text{CO}_2$ at seed-setting stage for a 1-hour period. Seed was sampled periodically and the lipids were extracted. A triglyceride-rich fraction was methanolized; the resultant methyl esters were analyzed by gas chromatography and assayed for radioactivity. Of the C_{18} -unsaturated

acids, oleic was the first to acquire radioactivity, which subsequently and successively appeared in linoleic and linolenic acids. The shapes of the radioactivity-time curves provide evidence that consecutive desaturation reactions occur in the seeds of these higher plants.

1972 • Characteristics of the Vegetative Growth of Bacillus popilliae

R.A. RHODES, E.S. SHARPE, H.H. HALL, and R.W. JACKSON
Appl. Microbiol. 14(2): 189-195. March 1966

Growth characteristics of the insect pathogen, Bacillus popilliae Dutky, were studied by propagation in shaken flasks and in 2-liter fermentors. Maximum populations between 5×10^8 and 2×10^9 viable cells per milliliter of culture medium routinely were obtained in incubation periods of 18 to 24 hours at 30° C. in a medium composed of 1.5% yeast extract, 0.6% K_2HPO_4 , and 0.2% glucose or trehalose. The carbohydrate required for growth in liquid media was fermented with the formation of 2 milliequivalents of acid per millimole of carbohydrate utilized; acid products ordinarily were not subsequently metabolized. B. popilliae is an aerobe, and the amount of growth varied with aeration to an optimum

at oxygen absorption rates of about 0.5. Maximum populations persist in a culture for periods of only 1 to 4 hours; cessation of growth was followed immediately by rapid death of cultures, so that less than 1% of the cells remained viable after 48 hours, and viability often was lost entirely by the end of 72 hours of incubation. No cytological evidence for spore formation was observed under any growth condition. Death was not associated with lysis of the cells, although extensive granulation ultimately occurred. Continuous neutralization, augmented buffering, various techniques of dialysis, or slow feeding of the carbohydrate did not markedly alleviate the characteristic death of the cultures.

- 1973 • Publications and Patents of the Northern Utilization Research and Development Division, July-December 1965
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., Unnumb. Pub., 40 pp. January 1966

- 1974 • Nitrogen Solubility Index, Isolated Protein Yield, and Whey Nitrogen Content of Several Soybean Strains
A.K. SMITH, J.J. RACKIS, P. ISNARDI, J.L. CARTTER,¹ and O.A. KROBER¹
(¹U.S. Regional Soybean Laboratory, Urbana, Ill.)
Cereal Chem. 43(2): 261-270. March 1966

Two modified procedures were developed to determine nitrogen solubility index (NSI). Both methods used a double extraction of dehulled, defatted soybean flakes. The first, on a 40-gram sample, had water-to-meal ratios of 20:1 and 10:1, with slow paddle stirring at 30° C. and pH 7.2; the second on a 2-gram sample, ratios of 60:1 and 50:1, with magnetic stirring at room temperature. Flaking cracked beans tempered to 14% moisture facilitated rapid extraction of oil and eliminated the need for grinding defatted flakes to obtain maximum and reproducible NSI values. Lower water-to-meal

ratios, pH, and different grinding reduced NSI values somewhat. With both methods NSI values averaged 93.6 (range 91-97) on 26 soybean strains. Their yield of isolated protein varied from 39 to 56 grams per 100 grams dehulled, defatted meal (moisture-free basis). Nitrogen content of the isolated protein varied between 13.4 and 15.2%. The small differences between strains in NSI would not aid in genetic selection of soybeans suitable for food and industrial use; however, the large differences in yield of isolated protein correlate directly with the protein content of the meal.

- 1975 • Bis(2,3:5,6-di-O-isopropylidene-D-mannitol) Orthocarbonate
B.S. SHASHA, W.M. DOANE, and W.K. ROHWEDDER
Tetrahedron Letters (14): 1479-1482. April 1966

A novel orthocarbonate derivative of a sugar has been isolated and identified. Its structure has two units of 2,3:5,6-di-O-isopropylidene-D-mannitol

commonly bonded through the oxygen atoms at C-1 and C-4 to a carbon atom.

- 1976 • Publications and Patents from Research on New Crops by Utilization Research and Development Divisions, 1944 through 1964
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., CA-71-30, 33 pp. April 1966. [Processed]

1977 • Polarization Colors of Maize Starches Varying in Amylose Content and Genetic Background

H.L. SECKINGER and M.J. WOLF

Die Stärke 18(1): 1-5, including a color plate. January 1966

The starch-iodine coloration of granules examined in crossed polars varies with the source of the starch. In most samples, the coloration is different from that seen in bright field. Except for waxy starches, polarization colors are either blue or red, or form a variegated pattern of blue and red. Waxy starches vary from yellow to brownish red similar to their bright field coloration. Yellow dent corn (U.S. 13 hybrid) with 27% amylose is a deep blue. Amylomaize (ae gene) shows a variegated red and blue pattern at low or intermediate amylose levels;

at amylose levels above 65%, the coloration is mostly red with little blue. Red color associated with the ae gene is lost in the genotype homozygous for ae wx, but is retained in combination with du or su₁ or su₂ genes. A small amount of red coloration is associated with the sugary genes (su₁ or su₂). Preliminary results suggest that, in general, the red polarization color is observed only in those starches that give X-ray patterns which are in part characterized as the "V" type.

1978 • Progress on Methods for Reducing Strontium-90 in Wheat and Milled Products

R.A. ANDERSON and V.F. PFEIFER

Radiol. Health Data 7(2): 57-60. February 1966

Various simple cleaning techniques were applied to four varieties of Kansas hard red winter wheat, to determine their effectiveness in removing strontium-90. As much as 73% of the strontium-90 content

in wheat and 80 to 83% in bran was removed by washing with dilute phosphoric or citric acid. This treatment also produced substantial reductions in the strontium-90 content of flour.

1979 • Increased Sensitivity of a Thermal Conductivity Detector by Cryostatic Operation

R.L. HOFFMANN and C.D. EVANS

J. Gas Chromatog. 4(5): 198. May 1966

Sensitivity of a thermal conductivity detector can be increased by cooling the cell. Cryostatic operation of the cell causes the difference in temperature between the hot filament and cell wall to increase, thereby enhancing the thermal conductivity response of the carrier gas. Cryostatic operation permits higher filament currents without concomitant elec-

trical noise, and achieves sixfold increases in detector sensitivity.

Obviously the technique is amenable only to compounds that will not condense in a cooled detector cell.

1980 • Removal of Metal Catalysts from Aldehyde Oils

R.E. BEAL

J. Am. Oil Chemists' Soc. 43(3): 122-124. March 1966

Aldehydes made from soybean or linseed oils, or their methyl esters, darkened and polymerized following preparation by ozonolysis and catalytic or chemical reduction in stainless-steel pilot-plant equipment. Treatment with a cation exchange resin in the hydrogen form substantially reduced the amount of color formed and polymerization.

When conducted before removing volatiles by

stripping, this resin treatment of soybean aldehyde oil decreased final color from Garuner 17 to 10, with a concomitant decrease in molecular weight and viscosity due to decreased polymerization. Resin pretreatment of methyl azelaaldehyde (MAZ) increased distillation yields. Since addition of several metal salts to MAZ reduced distillation yield to varying degrees, metal-catalyzed polymerization must occur.

1981 • Quantitative Determination of Unsaturation in Oils by Using an Automatic-Titrating HydrogenatorT.K. MIWA, W.F. KWOLEK,¹ and I.A. WOLFF(¹USDA Biometrical Serv., Peoria, Ill.)

Lipids 1(2): 152-157. March 1966

A procedure was developed to adapt an automatic-titrating hydrogenator to the rapid determination of unsaturated carbon-carbon bonds in seed oils. Its utility as a research tool for detecting unusual types of unsaturation was demonstrated by the analysis of 35 oils. For repetitive analysis of samples of the

same oil, or of oils having nearly the same amount of unsaturation, a new sample can be injected into the hydrogenator every 2 to 5 minutes. This method for monitoring samples could easily be adapted in oil-processing plants.

1982* • Chemical and Physical Properties of Soybean Oil

J.C. COWAN

Proc. Regional Oil Conf., sponsored by the Soybean Council of America, Inc., in Tehran, Iran, October 20-24, 1964, pp. 25-29

Soybean oil is a polyunsaturated oil, containing about 50% linoleic and 5 to 9% linolenic acids. Its flavor stability is lowered by linolenic acid, particularly if either 0.1 p.p.m. of iron or 0.01 p.p.m. of copper, or both, are present. The effects of these metals can be counteracted by addition of metal-

inactivating agents, such as citric acid. The hydrocarbons of the unsaponifiable portion may also be a factor in autoxidation and lower flavor quality and stability. Although the flash and fire points of soybean oil are comparable to cottonseed oil, its viscosity is slightly less.

1983* • Hydrogenated Winterized Soybean Oil

J.C. COWAN

Proc. Regional Oil Conf., sponsored by the Soybean Council of America, Inc., in Tehran, Iran, October 20-24, 1964, pp. 46-49

Improved oils for salad and cooking use can be prepared by a combination of hydrogenation and winterization. These oils have good flavor and

oxidative stability. They represent a commercial improvement in edible liquid soybean oil, particularly for frying foods.

1984* • Soybean Salad Oil and Salad Dressings

J.C. COWAN

Proc. Regional Oil Conf., sponsored by the Soybean Council of America, Inc., in Tehran, Iran, October 20-24, 1964, pp. 52-57

To manufacture the highest quality of soybean oil for use as a salad oil and in salad dressings, certain factors must be considered that affect its quality and stability. Also, there are specific tests

used to measure these properties. The significant factors and tests, including organoleptic techniques, are reviewed, as well as standard specifications for oil and commercial formulas for salad dressings.

1985* • Soybean Lecithin. Production and Use of Phosphatides

J.C. COWAN

Proc. Regional Oil Conf., sponsored by the Soybean Council of America, Inc., in Tehran, Iran, October 20-24, 1964, pp. 60-62

Production of soybean phosphatides by hydration, centrifugation, drying, acetone precipitation, and alcoholic fractionation is reviewed briefly. Also, the

properties, characteristics, and uses for soybean phosphatides or lecithin are detailed.

1986 • Glycolipids of *Briza spicata* Seed

C.R. SMITH, JR., and I.A. Wolff

Lipids 1(2): 123-127. March 1966

Seeds of *Briza spicata* contain 20% of a lipid that is semisolid and quite unusual in character. This lipid is composed of 49% digalactosylglycerides, 29% monogalactosylglycerides, and consequently little, if any, conventional triglycerides. The fatty acids pre-

dominating are palmitic, oleic, and linoleic. Partial resolution of the galactosylglycerides on the basis of fatty acid composition was achieved by counter-current distribution.

1987 • Measuring Wheat Kernel Hardness by Standardized Grinding Procedures

R.A. ANDERSON, V.F. PFEIFER, and A.J. PEPLINSKI
Cereal Sci. Today 11(5): 204-206, 208-209. May 1966

The measurement of wheat kernel hardness has long been of concern to plant breeders, millers, and cereal technologists. Numerous apparatus and methods for determining hardness are described in the literature. Some permit limited differentiation between wheats and their range of values is narrow.

Both the Brabender hardness tester and the pin mill give kernel hardness or friability indices that clearly reflect differences in wheats and varieties, are considerably more sensitive than other methods, and also indicate response to fractionation by fine

grinding and air classification of flours from the wheats.

In Brabender tests, the surface area of the flour fraction produced by grinding per unit of work expended proved a sensitive measure of kernel hardness. A 35-fold variation in surface area per unit of work occurred in going from the hardest wheat to the softest, along with marked differences between the groups of durum, hard red spring, hard red winter, and soft wheats. When these same wheats were ground in a pin mill, there was a 23-fold variation in flour surface area.

1988 • Effect of Reaction Variables on Distribution of Xanthate Groups in Starch Xanthate

D. TRIMNELL, W.M. DOANE, C.R. RUSSELL, and C.E. RIST
Die Stärke 18(2): 36-38. February 1966

Degree of substitution (D.S.) and distribution of xanthate groups between the primary and secondary positions of starch xanthate were determined according to the benzylation-tritylation method. Reaction variables, such as solids content, temperature, and time, affected both total xanthate substitution and distribution of substituents between the primary and secondary positions.

At 50% solids and 25° C, the D.S. increased from 0.29 to a maximum of 0.44 in 4 hours because of

unreacted carbon disulfide in the initial product. The distribution changed from an initial xanthated primary:secondary ratio of 2:3 to an ultimate ratio of 3:1 after 23 hours.

In an 11% aqueous dispersion stored at 5° C, and 20° C, the starch xanthate of D.S. 0.30 rose to the maximum of 0.33 in 3 days while the primary:secondary ratio changed from an initial 1:5 to a final 1:1 ratio near the D.S. maximum. The final ratio prevailed during subsequent decomposition of xanthate groups.

1989 • New Crops – Visionary Dream or Practical Reality?

IVAN A. Wolff
Econ. Botany 20(1): 2-5. January-March 1966

In this nontechnical review, it is pointed out that basic research on plants provides agriculture with a reservoir of useful information which can be tapped as required to meet the exigencies of various practical situations. Plant screening for new chemicals can lead to the development of useful new com-

mercial crops. Experience with *Crambe abyssinica* as a new crop is cited to illustrate both the accomplishments and some inherent difficulties to be surmounted in the effort by the U.S. Department of Agriculture to introduce new crops for the American farmer.

1990 • Extracellular Polysaccharides and Classification of the Genus Lipomyces

M.E. SLODKI and L.J. WICKERHAM

J. Gen. Microbiol. 42(3): 381-385. March 1966

Strains classified as Lipomyces lipoferus and L. starkeyi produce specific extracellular acidic heteropolysaccharides. The polymer from L. lipoferus contains mannose and glucuronic acid; the polymer from L. starkeyi contains, in addition, galactose and a trisaccharide. This trisaccharide is composed of

mannose and glucuronic acid in the molar ratio 1:2. The difference in polysaccharide composition may be the most significant physiological basis yet discovered for separation of species in the genus Lipomyces.

1991 • Synthetic Polypeptides Containing Side-Chain Amide Groups. Water-Soluble Polymers

LARRY H. KRULL and JOSEPH S. WALL

Biochemistry 5(5): 1521-1527. May 1966

Synthetic high-molecular weight polypeptides containing glutamine and glutamic acid residues served as model systems to investigate the influence of side-chain amides on protein conformation and aggregation in aqueous solutions. The polypeptides were prepared by converting ester groups of mixed polymers of glutamine and glutamyl esters to free carboxyls.

In some polymers, ester groups were retained to permit evaluation of hydrophobic forces. Solubilities and optical rotatory dispersion measurements at

various pH values established that the presence of amide groups increased the minimum pH for solubility and decreased the helical content of the polymers. The minimum pH for solubility of the polymers was lowered with urea. The presence of ester residues also decreased polypeptide solubility but stabilized helical structure. These findings suggest that in high-molecular weight polypeptides or proteins, containing high levels of asparagine or glutamine, conformation and aggregation in aqueous solution may result from hydrogen bonding between amide groups.

1992 • Propagation of Bacillus popilliae in Laboratory Fermentors

E.S. SHARPE

Biotechnol. Bioeng. 8(2): 247-258. May 1966

The insect pathogen Bacillus popilliae Dutky causes fatal milky disease of Japanese beetle larvae. Spores of the bacterium offer a biological means of controlling this insect. While satisfactory sporulation in vitro has not yet been accomplished, conditions have been developed for the proliferation of vegetative cells in shaken flasks and aerated fermentors. Vegetative cultures can be maintained either by frequent transfer or by lyophilization. Media based on yeast extract are used routinely, but corn steep liquor and casein hydrolyzates afford

comparable yields of 5×10^8 cells per ml. in 16 to 24 hours. Nutritional requirements have been established for growth in a synthetic medium. Oxygen availability affects the pathway of carbohydrate catabolism and is necessary for optimal growth. In rapidly growing cultures, a short period of maximum viability characteristically is followed by rapid death of the cells. When inoculum size and transfer time are suitably manipulated, viable cell yields reach 1 to 2×10^9 per ml.

1993 • **Corn Dry-Milling: A Comparison of Several Procedures for Tempering Low-Moisture Corn**

O.L. BREKKE

Cereal Chem. 43(3): 303-312. May 1966

In pilot-plant tests, corn (12 to 13% moisture content) from a single lot was degerminated in a studded-cone mill after being tempered by one of five procedures: (1) Dry corn given a second temper, (2) pretempered corn, (3) pretempered corn with a second temper, (4) pretempered corn with both first and second tempers, and (5) corn given conventional first and second tempers. Degermination was moderate to good for each procedure. Although the conventional temper gave the highest degerminator throughput, the other procedures gave the best yield

of flaking grits and total grits. With dry corn, oil recovery was appreciably lower. Results demonstrate that any one of the tempering procedures can be used. The choice depends upon various cost and process factors, such as product yields, degerminator throughput, tempering facilities, and dryer capacity, and the relative weight given to each factor. The results also point to the need for ascertaining the effect of moisture addition and movement upon the development of stresses within the corn kernel during tempering.

1994 • **Improved Chromatographic Separation of Gliadin Proteins on Sulfoethyl Cellulose**

F.R. HUEBNER and J.S. WALL

Cereal Chem. 43(3): 325-335. May 1966

A new procedure of ion-exchange chromatography has been developed that gives better resolution of individual proteins from Ponca wheat gliadin as measured by starch-gel electrophoresis of the separated fractions. The system is based on a 2.8 X 50-cm. column of sulfoethyl cellulose, a strong cation exchanger effective at low pH. The pH 3.6 buffer consisting of 0.03 M acetic acid and 0.01 M HCl, used for application and elution of protein,

contained 8 M urea. The ionic strength of the eluting buffer was gradually increased by an apparatus producing a variable gradient from 0 to 0.15 M NaCl. These optimum conditions were arrived at after tests of other ion-exchange materials, solvents, pH values, and ionic gradients. The final method yielded some pure individual gliadin proteins directly and also others which required minimum repurification.

1995 • **Survey of the Sensitivity of Microorganisms to Aflatoxin**

H.R. BURMEISTER and C.W. HESSELTINE

Appl. Microbiol. 14(3): 403-404. May 1966

Among the 329 microorganisms tested for aflatoxin sensitivity were 30 genera of bacteria, 34 genera of fungi, 4 genera of algae, and 1 protozoan. Twelve species of the genus Bacillus, a clostridium, and a streptomycete were inhibited where 30 μ g/ml.

of crude aflatoxin (36% pure) was incorporated into the growth substrate. A strain of Bacillus brevis and two of B. megaterium were most sensitive to aflatoxin, being inhibited at 10 and 15 μ g/ml., respectively.

1996 • Production of Aflatoxin on Rice

ODETTE L. SHOTWELL, C.W. HESSELTINE, R.D. STUBBLEFIELD, and
W.G. SORENSON

Appl. Microbiol. 14(3): 425-428. May 1966

A method has been developed to produce aflatoxin by growing a strain of Aspergillus flavus NRRL 2999 on a solid rice substrate. Optimum yields, more than 1 milligram of aflatoxin B₁ per gram of starting material, were obtained in 5 days at 28° C. A crude product containing aflatoxins was isolated by chloroform extraction and precipitation with hexane from concentrated solutions. This crude product consisted

of 50% aflatoxin in the following ratio: B₁:B₂:G₁:G₂: 1.00:0.15:0.22:0.02. Aflatoxin B₁ was separated from almost all the impurities and from the other aflatoxins by chromatography on silica gel with 1% ethyl alcohol in chloroform. Analytically pure aflatoxin B₁ was recrystallized from chloroform-hexane mixtures.

1997 • Infrared Spectrophotometric Procedure for Determining Azelaaldehydic Acid Derivatives

D.E. ANDERS and E.H. PRYDE

J. Am. Oil Chemists' Soc. 43(5): 305-306. May 1966

A convenient and accurate infrared procedure was developed for determining the conversion of azelaaldehydic esters to acetals by measuring dis-

appearance of the aldehydic C-H stretching vibration at 2720 cm.⁻¹ (3.68 μ).

1998 • Isomerization of Unsaturated Fatty Esters by Iron Pentacarbonyl. Preparation of Iron Tricarbonyl Complexes of Polyunsaturated Fats

E.N. FRANKEL, E.A. EMKEN, and V.L. DAVISON

J. Am. Oil Chemists' Soc. 43(5): 307-311. May 1966

Iron pentacarbonyl is a powerful isomerization agent of unsaturated fatty esters. Highly conjugated fats are obtained when polyunsaturated fatty esters are treated with an excess Fe(CO)₅ to form complexes followed by decomposition of the complexes with FeCl₃. Iron tricarbonyl complexes were prepared in 80 to 95% yields from methyl linoleate, linolenate, and polyunsaturated fatty esters of soybean, linseed, and safflower oils by heating at 180°

to 185° C. with 2 moles Fe(CO)₅ per mole ester under nitrogen pressure. Decomposition of these complexes with FeCl₃ resulted in 90 to 97% conjugation of the polyunsaturated fatty esters mainly in the all-trans configuration. Isolated trans unsaturation reached levels of 18 to 30%. Methyl oleate yielded 74% trans unsaturation, but no complex of iron carbonyl was obtained.

1999 • Compositional Differences Among Crambe Samples and Between Seed Components

F.R. EARLE, J.E. PETERS, I.A. WOLFF, and G.A. WHITE¹

(¹USDA Crops Research Div., Beltsville, Md.)

J. Am. Oil Chemists' Soc. 43(5): 330-333. May 1966

Data germane to the processing and utilization of crambe as a new oilseed include information on variations to be expected in gross composition of the seed (fruit) and its component parts.

From experimental plantings in 17 states 75 samples of *Crambe abyssinica* Hochst. ex R. E. Fries were analyzed. Samples as received contained 16 to 62% pod material (pericarp), the extremes representing samples with many seeds removed from the pod or with many pods containing no seed. The amount of pericarp was most often between 25 and 40%. Oil content of seed (without pericarp) ranged from 36 to 54%, with most samples between 40 and 48%; crude protein from 22 to 37%, usually 25 to 30%; and erucic acid in the oil from 39 to 60%, usually 53 to 59%.

Total thioglucoside content in 30 samples ranged from 8 to 10% calculated as epi-progoitrin in oil-free meal, although 2 samples were between 4 and 5%.

One sample was hand-separated into pericarp (40%) and seed, which was further separated into seed coat (8%), cotyledon (82%), and hypocotyl (10%). The pericarp contained only 0.4% lipid and the respective seed fractions 17, 55, and 38%. Their corresponding protein contents were 4, 23, 23, and 34%; and their thioglucoside contents (oil-free meal), 0.1, 2.1, 10.9, and 13.0%.

Cotyledon and hypocotyl were quite similar in amino acid composition. Neither contained hydroxyproline, which is in both pericarp and seed coat.

2000 • Crambe Seed Processing: Filtration-Extraction on a Bench Scale

L.D. KIRK, G.C. MUSTAKAS, and E.L. GRIFFIN, JR.

J. Am. Oil Chemists' Soc. 43(5): 334-336. May 1966

Crambe abyssinica is a potential source of erucic fatty acid and of good quality protein, provided satisfactory methods for processing the seed can be developed. Among the oil recovery methods currently under study is that of filtration-extraction, a direct solvent process for high-oil content seeds. Good oil recovery at satisfactory filtration rates was accomplished by a series of processing steps including dehulling, flaking, cooking, drying, crisping, and extracting with hexane.

When the conventional cook procedure was modi-

fied to incorporate an enzyme-conversion step, significant improvement in rat feeding tests was obtained without loss in subsequent extraction efficiency. The recovered oils from the nonconversion cooks were refined and bleached by conventional procedures to oils of light color. The oil product from the conversion cook apparently contained sulfur compounds, even after refining and bleaching, whose removal will require special treatment, as yet undeveloped, in order to produce a hydrogenatable oil.

- 2001 • **Microbiology of Wheat and Flour: Reduction of Microbial Population During Milling**
 V.F. PFEIFER and R.R. GRAVES
 Proc. Fourth Natl. Conf. Wheat Util. Research, held at Boise, Idaho,
 November 3-5, 1965
 West. Util. Res. Develop. Div.
 U.S. Agr. Res. Serv., ARS-74-35, pp. 60-64. April 1966

Research has shown that it is possible to control the microbial population of products milled from wheat by relatively simple treatments. Products with total microbial counts well below 5,000 per gram for use in convenience foods can be obtained from most wheats by proper combinations of wheat treatment, mill cleaning, flour stream selection, and flour treatment. In milling, up to 95% of the microbial population of a wheat is removed with the feed fractions, so that the microbial count of the flour will be

much lower than that of the original wheat unless microorganisms are picked up from the mill itself.

Storage of flour at temperatures of 100° to 140° F. appears to be a satisfactory way of removing 99% or more of the microbial population without causing objectionable flour damage. Heating wheat before milling appears to be even more satisfactory and should be adaptable to practically any commercial mill.

- 2002 • **Reactions of Cyclohexene Trithiocarbonate with Oxidants**
 B.S. SHASHA, W.M. DOANE, C.R. RUSSELL, and C.E. RIST
 Nature 210(5031): 89-90. April 2, 1966

Reactions of cyclohexene trithiocarbonate (CTC) with various oxidants were studied as models for the oxidations of carbohydrates possessing a thiocarbonyl group. When one molecular equivalent of lead tetraacetate was consumed by CTC, a novel oxythiocarbonyl derivative was formed. Reaction of

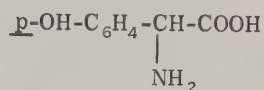
CTC with silver nitrate gave crystalline adducts, which contained either one or two moles of silver nitrate per mole of CTC. Potassium permanganate oxidized the thiocarbonyl group of CTC to a carbonyl group, which gave the corresponding cyclohexene dithiocarbonate.

2003 • A Novel Differential Titration To Determine pK Values of Phenolic Groups in Tyrosine and Related Aminophenols

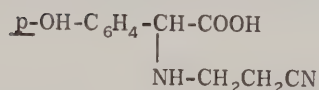
MENDEL FRIEDMAN

Biochem. Biophys. Res. Commun. 23(5): 626-632, June 1966

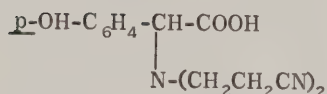
Acid-base equilibria of amino and hydroxy groups in tyrosine (I), N-cyanoethyltyrosine (II), and N,N-dicyanoethyltyrosine (III) were investigated by potentiometric and spectrophotometric titration procedures.



(I)



(II)



(III)

Cyanoethylation of the amino group in tyrosine causes a downward shift of the pK value of this functional group out of the range of the phenolic group. This modification, however, does not alter the pK values of the phenolic groups in II and III. Based on these observations, a new procedure was developed for determining pK values of phenolic groups in aminophenols. The new differential potentiometric titration procedure to estimate dissociation constants of aminophenols complements spectrophotometric methods and might have certain advantages when applied to proteins.

2004 • Current Grain Sorghum Research

C.W. BLESSIN and R.J. DIMLER

Sorghum Newsletter 9: 16-17, June 1966

Research is being conducted on the phenolic pigments in grain sorghum and on the composition

and nutritional quality of sorghum proteins.

- 2005* • Wheat and Flour Microbial Population Can Be Reduced During Milling Process**
 V.F. PFEIFER, C. VOJNOVICH, and R.R. GRAVES
 Am. Miller 94(5): 15-17. May 1966

The results of a survey of commercially milled flours show that bacterial counts in flours varied from 220 to 8,600 per gram. In the original wheats, counts varied from 15,000 to 660,000 per gram. Mold counts were from 90 to 8,100 per gram in the flours and from 80 to 1,400 per gram in the original wheats. Bacterial counts are much lower in the flour than in the wheat from which it is milled. Mold counts, however, are higher for some flours than for their wheats.

Processing methods suitable for use at the mill

to produce flours having microbial counts of 5,000 per gram or less include: fumigation of wheat with ethylene or propylene oxide—suitable conditions for propylene oxide being the treatment of wheat at 13% moisture for 6 hours at 120 ° F., with an epoxide concentration of 1.5 grams per liter; heating wheat before milling—suitable conditions being the heating of wheat containing 13% moisture for about 6 hours at 140 ° F.; storage of the milled flour in the range of 100 ° to 140 ° F. for from 24 days to less than 1 day, respectively.

- 2006 • Effects of Various Soybean Products on Flatulence in the Adult Man**
 F.R. STEGGERDA,¹ E.A. RICHARDS,¹ and J.J. RACKIS
 (¹University of Illinois, Urbana)
 Proc. Soc. Exptl. Biol. Med. 121(4): 1235-1239. April 1966

In four human male subjects, kept on a carefully controlled diet to which various fractions of soybean meal were added, the flatus-producing factor in soybeans was concentrated primarily in the low molecular-weight constituents. These experiments also showed that the soybean hulls, fat, water-insoluble polysaccharides, and protein are not associated with

flatulence production to any significant degree. Caseinate and soybean proteinate appear to inhibit flatulence. When equivalent amounts of navy bean meal were consumed, flatus volumes increased 2.52 times that following the consumption of dehulled, defatted soybean meal.

- 2007 • Soy Flour in Five Easy Steps**
 [D.H. MAYBERRY]
 Soybean Dig. 26(8): 34, 36. May 1966

Reports briefly an inexpensive process to make protein-rich soy flour. Only the hulls are discarded in converting soybeans to full-fat flour in equipment

readily available for villagers in the developing countries to use.

2008 • Industrial Uses of Wheat and Flour

DWIGHT L. MILLER

Proc. Fourth Natl. Conf. Wheat Util. Research, held at Boise, Idaho,
November 3-5, 1965

West. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-74-35, pp. 80-87. April 1966

Industrial markets for wheat, except during World War II, have been small. During the war emergency, wheat was extensively used to make alcohol, starch, and paper additives. From a physical and chemical standpoint, wheat is a suitable raw material for industrial uses. Processes, such as the "Batter Process," that convert wheat flour into starch and gluten have been developed. The major drawback

to wheat is its normally higher price than other available grains. Exploitation of the unique properties of wheat starch and wheat gluten through physical and chemical modification offers a way to increase industrial markets for wheat. Fundamental research is necessary to supply the information and know-how for successful applied research development.

2010 • Wet-Rub Resistant Clay Coatings with Dialdehyde Starch Adhesives

M.E. CARR, B.T. HOFREITER, and C.E. RIST

Tappi 49(6): 244-248. June 1966

Dialdehyde starches (DAS) prepared by periodate oxidation of corn starch, over the range of 2 to 100% of theoretical conversion, have been evaluated in the laboratory as paper coating adhesives. Conditions for preparation of high-solids coating mixtures were determined, and wet-rub resistant coatings were developed without the use of secondary insolubilizing agents.

Paste dispersions of DAS (25 to 40% concentrations) were controlled by temperature, time, and quantitative additions of alkali. Coating mixtures

prepared varied from 50 to 70% solids and contained an adhesive level of 15 parts per 100 parts of clay.

The 10%-oxidized DAS gave the best over-all performance as judged by dispersibility, paste viscosity, setback, and the ability to achieve high-solids coating mixtures. The adhesive strengths of DAS were nearly equivalent to commercially modified starch coating adhesives. The maximum wet-rub resistance of freshly dried coatings was similar to that of commercial offset-grade coatings.

2011 • Microbiology of Flours

C.W. HESSELTINE and R.R. GRAVES

Econ. Botany 20(2): 156-168. April-June 1966

From this review of the literature on microorganisms of flour, various conclusions can be made: Flour always contains a flora of bacteria and fungi. The fungus flora is well established and is generally limited to Aspergillus and Pencillium, especially A. candidus and the A. glaucus groups. The types of fungi present are not those found on wheat in the field but duplicate those forms found in storage. Considerable contamination of flour with fungi originates within the mill. Under usual conditions, moisture is the most important factor determining spoilage of flour. If the moisture level is 12% or less, no growth of microorganisms occurs. As flour

with a low-moisture content is kept in storage, the number of viable microorganisms decreases fairly rapidly. Except for the rope organism, the bacterial flora of flour and the source of these organisms are poorly known. Bacterial count is greater than mold count. Special media are required for the enumeration of molds and bacteria.

Probably the most important problem of flour microbiology is the identification and the source of origin of the bacterial population. In our opinion this population may be as specialized as the fungus flora.

2012 • Analysis for Stereoisomers of Beta-Carotene in Fermentation Preparations

GEORGE E.N. NELSON, ALEX CIEGLER, and HARLOW H. HALL

J. Food Sci. 31(3): 359-361. May-June 1966

The potential vitamin A activity of a carotene-containing preparation from mated cultures of Blakeslea trispora was determined by the stereoisomers in the β -carotene fraction. The β -carotene extracted from fresh mycelia contained about 94%

of the all-trans isomer, the rest being about 3.5% of neo- β -carotene B and 2.5% of neo- β -carotene U. Beta-carotene from stored dried preparations showed about 91% of all-trans, 7.5% of neo- β -carotene B, and 1.5% of neo- β -carotene U.

2013 • Preparation of Pure Methyl Esters by Counter Double Current Distribution

C.R. SCHOLFIELD, R.O. BUTTERFIELD, and H.J. DUTTON

Lipids 1(3): 163-165. May-June 1966

Counter double current distribution with continuous stills for solvent and product recovery and an acetonitrile-hexane solvent system is a convenient method for preparative isolation of individual fatty

methyl esters. Preparations of pure methyl linoleate from safflower esters and a methyl arachidonate concentrate from hog liver lipids are described.

- 2014 • Quantitative Separation of Methyl 9-Hydroxystearate from Methyl 13-Hydroxystearate by Column Chromatography on Silica Gel
AMI DOLEV, W.K. ROHWEDDER, and H.J. DUTTON
Lipids 1(3): 231-233. May-June 1966

A method is described for the quantitative separation of methyl 9-hydroxystearate from methyl 13-hydroxystearate. The separation is accomplished by

column chromatography on silica gel with a solvent gradient of hexane and diethyl ether.

- 2015 • Isolation of Methyl cis-15-Octadecenoate by Chromatography on a Silver-Treated Macroreticular Exchange Resin
C.R. SCHOLFIELD and E.A. EMKEN
Lipids 1(3): 235-236. May-June 1966

Methyl cis-15-octadecenoate was isolated in 25% yield from a mixture of methyl cis-15-, -12-, and -9-octadecenoates by repeated passage through a silver-treated macroreticular exchange resin. Phys-

ical constants are reported including melting point, refractive index, density, and equivalent chain length for gas chromatography.

- 2016 • Chemical Analyses of Seeds. II: Oil and Protein Content of 759 Species
QUENTIN JONES¹ and F.R. EARLE
(¹USDA Crops Research Div., Beltsville, Md.)
Econ. Botany 20(2): 127-155. April-June 1966

Data are presented on 1,010 samples of seed representing 759 species in 103 plant families. Those families rich in seed oil tend to be rich in seed protein. Within families, seeds of Compositae, Cucurbitaceae, Labiatae, Malvaceae, and Ranunculaceae show positive correlation between oil and protein contents; whereas seeds of Cruciferae,

Euphorbiaceae, Scrophulariaceae, and Umbelliferae show none. Within the Leguminosae, seeds containing starch are, on the average, twice as large as those without starch. Among nonstarchy legume seeds, those with more than 10% oil are generally larger than those with less than 10% oil.

2017 • On Growing Syncephalis in Pure Culture

J.J. ELLIS

Mycologia 58(3): 465-469. May-June 1966

It has been discovered that cultures of Syncephalis can be maintained on a complex organic medium in the absence of a fungal host. A pH range from 7 to 8 was nearly optimum for growing isolates, and a

temperature range of 18° to 22° C. was optimum for growth and sporulation. Apparently some of the material in liver solids essential for growth of Syncephalis is water-insoluble.

2018 • Hydrolysis Products from an Extracellular Tremella Polysaccharide

M.E. SLODKI

Can. J. Microbiol. 12(3): 495-499. June 1966

The composition of an extracellular heteropolysaccharide from Tremella mesenterica Fries NRRL Y-6151 (O-acetyl:xylose:mannose:glucuronic acid molar ratio 0.5:4.4:3.8:1) was investigated by examination of partial acid hydrolysis products. Removal of D-xylose residues by mild hydrolysis gave a

polymer containing xylose:mannose:glucuronic acid in a molar ratio of 2.8:3.6:1. More extensive hydrolysis led to the formation of oligosaccharides containing mannosyl units appended to 2-O-(β -D-glucopyranosyluronic acid)-D-mannose.

2019 • Chromatography of Nucleotides in Extracts Containing Salts on Layers of Anionic, Microcrystalline Cellulose

D.D. CHRISTIANSON, H.B. SINCLAIR, and J.W. PAULIS

Biochim. Biophys. Acta 121(2): 412-413. June 1966

Chromatographic separation of nucleotides on thin layers of cellulose treated with polyethyleneimine has been improved by using a fine microcrystalline cellulose. Reproducible R_f 's of different nucleotides were obtained with this anion-exchange material by using LiCl solutions or other solvents for chromatography. Nucleotides contained in extracts of plant

tissues were chromatographed on these thin-layer plates following preliminary ion-exchange separation. Contaminating salts were removed from nucleotide mixtures directly on the plate with methanol. After this methanol desalting, nucleotide yields were superior to those obtained with other methods.

2020 • Graft Copolymers of Starch. I. Copolymerization of Gelatinized Wheat Starch with Acrylonitrile. Fractionation of Copolymer and Effect of Solvent on Copolymer Composition

GEORGE F. FANTA, ROBERT C. BURR, C.R. RUSSELL, and C.E. RIST
J. Appl. Polymer Sci. 10(6): 929-937. June 1966

A starch-polyacrylonitrile graft copolymer, prepared from gelatinized wheat starch with ceric ammonium nitrate as the initiator, has been freed of ungrafted polyacrylonitrile and separated into fractions by extraction with dimethylformamide, γ -butyrolactone, and dimethyl sulfoxide. The copolymer fractions differed appreciably in level of add-on, molecular weights of grafted chains, and grafting frequency. To determine the molecular weights of grafted chains, the starch part of the copolymer was effectively removed by hydrolysis with α -amylase. Before enzymatic hydrolysis it was necessary to either dissolve or swell the polymer in

dimethyl sulfoxide and freshly precipitate it by addition to water. In studying the effect of reaction medium on copolymer composition, less ungrafted homopolymer was formed, and yields of graft copolymer possessing more frequent grafts were higher with water than with either aqueous dimethylformamide or aqueous ethylene glycol. Polymer solubility, control polymerizations of acrylonitrile in the absence of starch, and detection of glucose end groups on the polyacrylonitrile liberated from the fractionated polymer by hydrolysis give evidence that the copolymers are true grafts rather than intimate mixtures.

2021 • Carbon-13 Magnetic Resonance of Diene-Iron Tricarbonyl Complexes

H.L. RETCOFSKY, ¹E.N. FRANKEL, and H.S. GUTOWSKY²

(¹Pittsburgh Coal Research Center, Pittsburgh, Pa.; ²University of Illinois, Urbana)
J. Am. Chem. Soc. 88(12): 2710-2712. June 1966

The ¹³C NMR spectra of butadiene-iron tricarbonyl and methyl octadecadienoate-iron tricarbonyl elucidate the structure of these complexes. The ¹³C-H coupling constants indicate that all the C-H bonds in the butadiene complex are essentially sp² hybrids. This observation, the ¹³C and proton chemical shifts, the H-H coupling constants, and other data are consistent with a structure in which

the bonding of Fe at C_{2,3} in the diene complexes is similar to that in ferrocene, but in which the terminal CH₂ or CHR groups are rotated about the C₁-C₂ and C₃-C₄ bonds of the ligand. This steric distortion of the ligand from planarity makes the bonding of the Fe at C_{1,4} differ somewhat from that at C_{2,3}, but both instances involve π orbitals on the carbons.

**2022 • Extracellular Heteropolysaccharides from Cryptococcus and Tremella:
A Possible Taxonomic Relationship**

M.E. SLODKI, L.J. WICKERHAM, and R.J. BANDONI¹

(¹The University of British Columbia, Vancouver, Canada)

Can. J. Microbiol. 12(3): 489-494. June 1966

Unisexual forms of certain Tremella species produce extracellular acidic heteropolysaccharides when grown on media containing glucose. The isolated polysaccharides contain the same components found in polymers produced by strains of Cryptococcus laurentii; i.e., D-glucuronic acid, D-xylose, D-mannose, and O-acetyl. Optical rotations and molar ratios of components were determined. The polysaccharides are characteristic of the various species of Tremella which produce them. Some of these species produce polymers that con-

tain much higher proportions of xylose than are found in the polymers produced by C. laurentii. Those tremellae that produce polymers resembling C. laurentii polysaccharides also give similar carbon assimilation patterns, but tremellae that produce polymers of higher xylose content also assimilate fewer carbon compounds. These findings, together with similarities in starch synthesis and morphology, suggest a relationship between some species of Tremella and Cryptococcus.

2023 • The Structure of Extracellular Phosphorylated Galactans from Sporobolomyces Yeasts

M.E. SLODKI

J. Biol. Chem. 241(11): 2700-2706. June 1966

Two strains of Sporobolomyces species, NRRL Y-6493 and NRRL Y-6502, produce extracellular, lightly acetylated, phosphorylated galactans when grown on media containing glucose as the carbon source. D-Galactose and D-galactose 6-phosphate were the only carbohydrate components present in strong acid hydrolyzates. α -D-Galactose 1-

phosphate was isolated after vigorous alkaline hydrolysis. Periodate oxidation analyses of intact and deacetylated polymers indicate that approximately equal proportions of α -1,6- and α -1,3-galactosyl linkages are present. Polymer phosphate occurs exclusively in the form of α -D-galactopyranosyl-1-phospho-6'-galactosyl phosphodiester end groups.

2024 • Structure of Unsaturated Glycerides. Analysis by Countercurrent Distribution and Lipase Hydrolysis

C.D. EVANS, D.G. McCONNELL, C.R. SCHOLFIELD, and H.J. DUTTON

J. Am. Oil Chemists' Soc. 43(6): 345-349. June 1966

The structure of highly unsaturated triglycerides, isolated from soybean, linseed, and safflower oils by countercurrent distribution, has been determined by pancreatic lipase hydrolysis. Compositions of positionally distinguishable glyceride isomers for the 5-double bond fraction from safflower oil, the 7-double bond fraction from soybean oil, and the 8-double bond fraction from linseed oil agreed with

values calculated according to the VanderWal-Coleman theory of 1,3-random-2-random distribution. The fatty acid analyses for individual isomers of the unsaturated glycerides demonstrated that positional isomers of glycerides may be present in nonrandom amounts even though the compositionally distinguishable glycerides approximate a random pattern.

2025 • Polyester Amides from Linseed Oil for Protective Coatings

L.E. GAST, WILMA J. SCHNEIDER, and J.C. COWAN

J. Am. Oil Chemists' Soc. 43(6): 418-421. June 1966

The sodium alkoxide-catalyzed reaction of linseed oil or linseed methyl esters with diethanolamine produces linseed diethanolamides almost exclusively. Among the reaction conditions reported are temperature, amount of excess diethanolamine, and mode of adding reactants. The best conditions for producing diethanolamide directly from linseed oil (1 mole) required adding oil to the sodium alkoxide in diethanolamine (6 moles) and heating at 110° to 115°C. for 35 minutes. The linseed diethanolamide isolated in 93 to 95% yield was an amber oil. Progress of the

reaction, followed by thin-layer chromatography, showed only trace amounts of byproducts.

Polyester amides were prepared by heating linseed diethanolamide in refluxing xylene with dibasic acids or anhydrides; e.g., azelaic, maleic, fumaric, phthalic, terephthalic, itaconic, brassylic, and dimer acids. Molecular weight, viscosity, and film properties (air-dried and baked) of the polyester amides were determined.

2026 • Spore Formation by Bacillus popilliae in Liquid Medium Containing Activated Carbon

W.C. HAYNES and LENORA J. RHODES

J. Bacteriol. 91(6): 2270-2274. June 1966

Previously sporulation of Bacillus popilliae in liquid culture could not be induced. We have discovered that sporulation will occur in tryptone-glucose-yeast extract broth shaken cultures if activated carbon (charcoal) is present during growth. The spores so engendered have survived drying in air and subsequent storage for several months as dry films and also in dry soil, sand, and a mixture

of powdered calcium carbonate and talc. Even when spores are absent, the longevity of cultures containing activated carbon is extended to several weeks at a population of millions of cells per milliliter. This extension of life is the result of a marked change from rapid decline in numbers to an almost stationary population.

2027 • Alkali Metal Complexes of Carbohydrates. I. Interaction of Alkali Metal Salts with Carbohydrates in Alcoholic Media

JACOB A. RENDLEMAN, JR.

J. Org. Chem. 31(6): 1839-1845. June 1966

The interaction of uni-univalent alkali metal salts with carbohydrates in anhydrous alcoholic media is shown to be rapidly reversible; isolable adducts, probably chelates, whose combining ratios often vary with salt concentration are produced. High salt concentration favors polycation adduct formation and increases carbohydrate solubility in alcohol. Stoichiometry for the reaction of potassium acetate with methyl β -D-glucopyranoside in homogeneous ethanolic solution was studied polarimetrically. Electrophoretic and ebulliometric studies showed little difference in complexing ability between sodium ion

and potassium ion; lithium ion is relatively weak. There was no evidence that carbohydrates combine with free nonbasic univalent anions; however, the probability is great that anions are involved in the interaction of undissociated molecules (ion pairs) of salt with carbohydrates. Techniques for electrophoresis of alcoholic solutions on glass fiber paper were developed. Rates of carbohydrate migration are much faster in alcoholic than in aqueous salt solution. The order of decreasing ability to promote migration in methanolic salt solution is $\text{Ca}^{2+} > \text{Na}^+ > \text{K}^+ > \text{NH}_4^+ > \text{Li}^+$.

2028 • Alkali Metal Complexes of Carbohydrates. II. Interaction of Bases with Carbohydrates in Alcoholic Media

JACOB A. RENDLEMAN, JR.

J. Org. Chem. 31(6): 1845-1851. June 1966

Reaction between alkali metal hydroxides and carbohydrates in anhydrous alcoholic media at 25° produces isolable carbohydrate alcoholates, probable chelates. A minor fraction of the product appears to be a carbohydrate-alkali metal hydroxide adduct. Adducts are produced exclusively if the reaction medium contains 10% or more water. Some adducts can be thermally converted to alcoholates, provided the carbohydrate moiety does not simultaneously decompose. Under the proper conditions, most alcoholates combine with one molecule or, in rare instances, two additional molecules of carbohydrate. Reactions that produce carbohydrate-metal hydroxide adducts show a stoichiometry of even greater

variability. Combining ratio is a function of cation radius, hydroxide concentration, and carbohydrate geometry.

Alkali metal cyanides react with carbohydrates in ethanolic media to give a mixture of carbohydrate alcoholate and carbohydrate-metal cyanide adduct. The alcoholate predominates. Sodium 1-butoxide, prepared from sodium hydroxide and 1-butanol by removing water of formation by azeotropic distillation, reacts with methyl α -D-glucopyranoside in refluxing 1-butanol to give the monosodium alcoholate.

2029 • Grafting Vinyl Monomers to Starch by Ceric Ion. I. Acrylonitrile and Acrylamide

ZOILA REYES,¹ C.E. RIST, and C.R. RUSSELL

(¹Stanford Research Institute, Menlo Park, Calif.)

J. Polymer Sci., Part A-1, 4(5): 1031-1043. May 1966

Studies were carried out on the grafting of acrylonitrile (AN) and acrylamide (AA) to starch by ceric ion. The variables affecting the grafting of AN and AA were investigated with granular wheat starch dispersed in aqueous N,N-dimethylformamide and ceric ammonium nitrate as catalyst. Results showed that the concentrations of monomer and catalyst are the major factors influencing the grafting of AN; thus the monomer content of the grafts can be regulated by these variables. The grafting of AA is also influenced by these variables, but to a much less degree. Increasing concentrations of monomer promote homopolymerization and increasing concentrations

of catalyst inhibit grafting. The extent of grafting of this monomer can best be controlled by reaction time. Under the most favorable conditions, maximum grafting efficiency (ratio of amount of grafted monomer to total amount of monomer converted to polymer) was 87% for AN and 43.8% for AA. Although the monomer content of the AN grafts was higher than that of AA grafts prepared under identical conditions, the number of branches in the grafts was almost the same; only the length of the branches was different. The AN-starch grafts have branches of higher molecular weight.

REPUBLICATION

- 1839 • **Recherches sur [la] Structure des Protéines dans le Gluten du Froment**
 R.J. DIMLER
 Meunerie Belge 62(57): 7-17. April 1966

This article on "Exploring the Structure of Proteins in Wheat Gluten" published in Baker's Digest for October 1965 has been translated into

French. The original appeared in the Proceedings of the Third National Conference on Wheat Utilization Research, November 1964.

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

- 159-C • **Hydridochlorobis(triphenylphosphine)platinum(II) and Some Related Compounds**
 JOHN C. BAILAR, JR., and HIROSHI ITATANI
 University of Illinois, Urbana
 Inorg. Chem. 4(11): 1618-1620. November 1965
- 160-C • **Crosslinking of Dialdehyde Starches with Wheat Proteins**
 ARUN K. CHATTERJI and LIONEL K. ARNOLD
 Iowa State University, Ames
 J. Polymer Sci., Part A, 3(11): 3857-3864. November 1965
- 161-C • **Amino Derivatives of Starches. Derivatives of 3,6-Diamino-3,6-dideoxy-D-altrose**
 M.L. WOLFROM, YEN-LUNG HUNG, and DEREK HORTON
 The Ohio State University, Columbus
 J. Org. Chem. 30(10): 3394-3400. October 1965

- 162-C • **Amino Derivatives of Starches. 2,6-Diamino-2,6-dideoxy-D-mannose Dihydrochloride**
M.L. WOLFROM, P. CHAKRAVARTY, and D. HORTON
The Ohio State University, Columbus
J. Org. Chem. 30(8): 2728-2731. August 1965
- 163-C • **Production and Stabilization of Cells of Bacillus popilliae and Bacillus lentimorbus**
RALPH N. COSTILOW, CHARLES J. SYLVESTER, and ROLLIN E. PEPPER
Michigan State University, East Lansing
Appl. Microbiol. 14(2): 161-169. March 1966
- 164-C • **Evidence for an Intracytoplasmic Membrane in the Core of Spores of Bacillus popilliae**
S.H. BLACK and M.I. ARREDONDO
Baylor University College of Medicine, Houston, Texas
Experientia 22(2): 77-78. February 1966
- 165-C • **Cellulose Vinylation. Determination of Optimum Conditions by Response Surface Designs**
JAMES W. BERRY, HENRY TUCKER, ARCHIE J. DEUTSCHMAN, JR., and JOHN P. EVANS
University of Arizona, Tucson
Ind. Eng. Chem., Process Design Develop. 5(2): 165-166. April 1966
- 168-C • **Catalytic Hydrogenation of Soybean Oil Methyl Esters and Some Related Compounds**
JOHN C. BAILAR, JR., and HIROSHI ITATANI
University of Illinois, Urbana
J. Am. Oil Chemists' Soc. 43(6): 337-341. June 1966
- Report of research work done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division. □
- 4-G • **Reactivity of Acetylated Glycosylsulfenyl Bromides**
D. HORTON and MARTHA J. MILLER
The Ohio State University, Columbus
Carbohydrate Res. 1(4): 335-337. December 1965

- 5-G • Photochemistry of Carbohydrate Derivatives. Photolysis of D-Galactose Diethyl Dithioacetal
DEREK HORTON and JON S. JEWELL
The Ohio State University, Columbus
J. Org. Chem. 31(2): 509-513. February 1966
- 6-G • β Elimination of Glycoside Monosaccharide from a 3-O-(2-Amino-2-deoxy-D-glucopyranosyl)serine. Evidence for an Intermediate in Glycoprotein Hydrolysis
J.R. VERCELLOTTI and A.E. LUETZOW
Marquette University, Milwaukee, Wis.
J. Org. Chem. 31(3): 825-830. March 1966
- 7-G* • Moisture Relations in Germ, Endosperm, and Whole Corn Kernel
LEORA SHELEF and NURI N. MOHSENIN
Pennsylvania State University, University Park
Cereal Chem. 43(3): 347-353. May 1966

[Report of research work supported with funds provided by the U.S. Department of Agriculture under the authority of U.S. Public Law 480, 83rd Congress, and sponsored by the Northern Utilization Research and Development Division.]

- 97-F • Preparation of a Mixed Disulphide Between Mercapto-Succinyl-Dextran and Cysteamine
C. De MARCO, G. BOMBARDIERI, M.R. BRUZZESI, and A. ROSSI FANELLI
University of Rome, Rome, Italy
Ital. J. Biochem. 14(1): 39-43. January-February 1965
- 98-F • Studies on Dextran and Dextran Derivatives. Note III. Preparation and Properties of Carboxymethyl and Diethylaminoethyl Derivatives of Native Dextran
E. ANTONINI, L. BELLELLI, M.R. BRUZZESI, A. CAPUTO, E. CHIANCONE, B. MONDOVI, A. ROSSI FANELLI, and R. ZITO
University of Rome, Rome, Italy
Ital. J. Biochem. 14(2): 90-100. March-April 1965

- 99-F • **Association-Dissociation Properties of Lysozyme**
M. ROSARIA BRUZZESI, EMILIA CHIANCONE, and ERALDO ANTONINI
University of Rome, Rome, Italy
Biochemistry 4(9): 1796-1800. September 1965
- 100-F • **Studies on Flavor Components in Soybean. Part I. Aliphatic Carbonyl Compounds**
MASAO FUJIMAKI, SOICHI ARAI, NORIMASA KIRIGAYA, and YOSITO SAKURAI
The University of Tokyo, Tokyo, Japan
Agr. Biol. Chem. (Tokyo) 29(9): 855-863. September 1965
- 101-F • **NMR Spectra and Conformation of Glucose and Some Related Carbohydrates in Dimethylsulphoxide Solution**
B. CASU,¹ M. REGGIANI,¹ G.G. GALLO,² and A. VIGEVANI²
¹Scientific Institute of Chemistry and Biochemistry, Milan, Italy
²Lepetit Research Laboratories, Milan, Italy
Tetrahedron Letters (27): 2253-2259. July 1965
- 102-F • **Generalized Treatment of Reversibly Reacting Systems in Transport Experiments, Illustrated by an Antigen-Antibody Reaction**
LILO M. GILBERT and G.A. GILBERT
University of Birmingham, Birmingham, England
Biochem. J. 97(1): 7c-9c. October 1965
- 103-F* • **Ricerche sull'autossidazione delle Sostanze Grasse Polinsature. V. [Research on the Autoxidation of Polyunsaturated Fatty Materials. V.]**
E. FEDELI, A.F. VALENTINI, A. LANZANI, and G. JACINI
Experiment Station for the Fats and Oils Industries, Milan, Italy
Riv. Ital. Sostanze Grasse 42(10): 488-492. October 1965
- 104-F • **Chemical Composition of Soybean Saponins**
B. GESTETNER, Y. BIRK, and A. BONDI
Hebrew University, Rehovoth, Israel
Israel J. Chem. 2(5a): 246-247. December 1964
- 105-F* • **Structure of the Cell Wall of Staphylococcus aureus Strain Copenhagen. V. Isolation of Peptidases Active on the Peptide Moiety of the Cell Walls of Some Gram-Positive Bacteria**
J.M. GHUYSEN, L. DIERICKX, M. LEYH-BOUILLE, J.L. STROMINGER, E. BRICAS, and C. NICOT
Biochemistry 4(10): 2237-2244, October 1965

- 106-F* • Structure of the Cell Wall of Staphylococcus aureus Strain Copenhagen. VI. The Soluble Glycopeptide and Its Sequential Degradation by Peptidases
J.M. GHUYSEN, D.J. TIPPER, CLAIRE H. BIRGE, and J.L. STROMINGER
Biochemistry 4(10): 2245-2254. October 1965
- 107-F • An Enzymic Method for the Microdetermination of the Average Unit-Chain Lengths of Glycogen and Amylopectin
M. ABDULLAH, E.Y.C. LEE, and W.J. WHELAN
Royal Free Hospital School of Medicine, London, England
Proc. Biochem. Soc. 97(2): 10P. September 1965
- 108-F* • Fractionation of Soybean Oil Fatty Acids by Crystallization as "Acid" Sodium Soaps
ERKKI UKSILA, INKERI MATTILA, and PAAVO ROINE
University of Helsinki, Helsinki, Finland
Suomen Kemistilehti B 36(4): 84-88. April 1963

LICENSING OF PATENTS

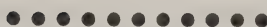
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January – June 1966



PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

Improved Methods for Producing Tempeh

CLIFFORD W. HESSELTINE and ALCIDES MARTINELLI, JR.

U.S. Patent 3,228,773. January 11, 1966

Prepackaged family-size units of tempeh, a traditional Indonesian fermented soybean food that is deep-fried before eating, are prepared by subjecting dehulled soybeans or large soybean grits that have been first soaked in water and then sterilized by cooking to inoculation with spores washed from a potato-dextrose-agar pure culture of a member of the genus Rhizopus. Following thorough

mixing, the uniformly inoculated soybean material is packed into transparent plastic bags or in tube-like plastic casing, either of which has 0.2-inch perforations spaced not more than 0.5 inch apart to permit the access of air required by the organism. Following closure, the filled containers are incubated at 22° to 37° C. for about 22 to 24 hours to provide a uniformly high-quality tempeh.

Single Application Linseed Oil-in-Water Emulsions for Curing and/or Preventing Spalling of Concrete

WILLIAM L. KUBIE, SR.

U.S. Patent 3,228,777. January 11, 1966

Highly stable water-dispersible linseed oil compositions containing neither waxes nor flammable organic solvents have been prepared. The non-aqueous compositions readily form sprayable "dual purpose" film-forming linseed oil-in-water emulsions upon mixing with about 1 to 1.5 volumes of water. The water-compatible emulsions can be sprayed or painted on cured (older) Portland cement or concrete immediately after a rain to form durable films that prevent the surface absorption of freeze-thaw susceptible water that causes spalling. When sprayed on freshly poured cement or concrete, the novel linseed oil-in-water emulsions rapidly form durable water-barrier films that first serve as effective curing agents and then, despite traffic,

retain sufficient integrity to provide an effective anti-spalling action.

Typically, the novel water-emulsifiable compositions are prepared by forming a solution of about 3 parts of C₁₂ or higher saturated alcohol (e.g., octadecanol or commercial tallow alcohols) in 100 parts of boiled linseed oil, adding about 0.0001-0.03 parts by weight of dipicolinic acid dispersed in 2-amino-2-methanol-1-propanol, and optionally, about 0.8 part of a soap-forming alkali solution accompanied by a co-acting soap-solubilizing mixture consisting of about 2 parts of 4-methoxy-4-methylpentanol-2 and 1 part of ethylene glycol.

Process for Microbial Polysaccharide

MARTIN C. CADMUS and RALPH F. ANDERSON

U.S. Patent 3,228,855. January 11, 1966

A microbial polysaccharide consisting of glucose, galactose, mannuronic acid, and O-acetyl moieties in the molar proportions of 1:1:1:5 is obtained by ethanol-KCl precipitation from an aerobic fermentation of Arthrobacter viscosus NRRL B-1973 or A. viscosus NRRL B-1797 in a buffered medium com-

prising carbohydrate, a limited source of nitrogen, and trace metals. The addition of 0.05% $\text{Al}_2(\text{SO}_4)_3$ to a 1% aqueous solution of the polysaccharide causes a twentyfold increase in viscosity, and the polysaccharide has potential as an additive for drilling muds and hydraulic fluids.

Preparation of Aminoguanidine Derivatives

CHARLES L. MEHLTRETTER

U.S. Patent 3,230,213. January 18, 1966

A composition of matter comprising a cationic oxidized-starch hydrazone obtained by reacting an oxidized starch containing carbonyl groups with

soluble salts of aminoguanidine in an acidic medium under nongelatinizing conditions.

Cereal-Containing Varieties of Tempeh and Process Therefor

CLIFFORD W. HESSELTINE and MABEL L. SMITH

U.S. Patent 3,243,301. March 29, 1966

Tempeh, an Indonesian food prepared by subjecting an exclusively soybean substrate to the growth of amylose-containing molds that cause highly disagreeable flavors from cereal starch materials, can now be prepared by fermenting any preboiled cracked cereal grain or cereal grain-soybean grit mixture

with the mold Rhizopus oligosporus NRRL 2710 under aerobic conditions for about 18 to 22 hours. Deep-fried chips of these new forms of tempeh can be expected to have a strong appeal and acceptance as a snack item.

Cationic Oxidized Starch Products

CHARLES L. MEHLTRETTER

U.S. Patent 3,251,826. May 17, 1966

Novel cationic oxidized starch hydrazones having utility as retention, flocculating, sizing, and suspending agents, and (the highly oxidized starch partial hydrazones) as wet- and dry-strength-producing additives for wet-end addition to paper pulps are obtained by reacting oxidized starches containing at least 0.5% of theory and up to 90% or more of theory of reactive carbonyl groups with a water-soluble alkyl-substituted hydrazine or hydrazide containing at least one tertiary nitrogen or quarternary nitrogen atom and represented by the formula $\begin{smallmatrix} R_1 \\ R_2 \end{smallmatrix} N \cdot NH_2$, wherein only one of R_1 and R_2 may be hydrogen and each of

R_1 and R_2 may also be further selected from the group consisting of alkyl, quarternary nitrogen-substituted acyl, and tertiary nitrogen-substituted acyl, wherein R_1 and R_2 together total not more than 10 carbon atoms, the oxidized starch and nitrogen-containing components being reacted in an acid aqueous medium and only up to 20% of the available oxidized starch carbonyl groups being reacted when the oxidized starch reactant is a substantially fully oxidized dialdehyde starch.

Process for Fractionating Film-Grade Amylose From Amylomaize Starch

ROY A. ANDERSON and CHARLES VOJNOVICH

U.S. Patent 3,252,836. May 24, 1966

A continuous process for rapidly obtaining high yields of film-grade amylose containing not over 20% of amylopectin and having an intrinsic viscosity in 1 N KOH of at least 1.0 comprises a 4 to 8% solution of amylomaize starch having an initial apparent amylose content of about 40 to 70% by cooking an aqueous slurry of said starch at 275° to 325° F. for 5 to 15 minutes with direct steam, flashing the resulting solution, cooling to about 180° to 200° F., adding 5 to 10% based on the dry weight of said starch of a

complexing agent selected from the C_8 - C_{10} monocarboxylic aliphatic acids and corresponding to primary alcohols, holding the mixed solution at 180° to 200° F. for about 10 to 15 minutes to complex the amylose, cooling between 120° to 150° F. to crystallize the complex, isolating the crystals, washing the crystals in hot water containing a small amount of complexing agent, drying the washed material, and then washing it in 85% methanol to defat the amylose and remove any remaining complexing agent.

Film-Forming Organometallic Derivatives of Fatty Acids

RAYMOND NOEL FAULKNER and LEONARD ALFRED O'NEILL

U.S. Patent 3,258,475. June 28, 1966

Film-forming derivatives of organometallic alkoxides that are particularly adapted for employment as coatings for metals and that may be incorporated in alkyd resins are prepared by reacting either an aluminum titanium or copper isopropoxide with ethylacetoacetate to form the corresponding

metallic aceto-acetate complex and then inter-esterifying either a toluene or xylene solution of the latter by refluxing with an unsaturated fatty alcohol; e.g., linoleyl, linolenyl, oleyl, mixtures thereof, and ricinoleyl. Diphenylol propane may be interreacted by addition to the alcoholysis step.

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